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| Subject: DIAGNOSTIC PROCEDURE FOR ENGINE NOISE REPAIR | Bulletin No: 01-053/09 |
| | Last Issued: 12/01/2009 |

APPLICABLE MODEL(S)/VINS

2006 - 2010 MX-5

2004 - 2010 Mazda3

2006 - 2010 Mazda5

2003 - 2010 Mazda6 2.3L/2.5L

DESCRIPTION

Some vehicles may exhibit various types of engine noise such as knocking, ticking, tapping, rattling, grinding, squealing, squeaking, thumping, whining, creaking, popping, clicking or roaring. If you encounter engine noise, refer to the following repair procedure. If any parts can be reused after inspection, be sure to reuse them.

REPAIR PROCEDURE

DIAGNOSTIC PROCEDURE

| Step | Inspection | Result | Action |
|------|--|---------------------------|--|
| 1 | Verify if the noise is coming from the engine or body. Listen to the noise with a sound scope or Chassis Ear at the engine or body then compare. Refer to the following illustrations for points to measure the noise. Is the noise only heard on the body side? Is the noise heard on the body side louder than that heard on the engine side? | If Yes to either question | Engine mount trouble is suspected. Check torque of engine mount bolt, oil leak from mount and engine mount damage according to Workshop Manual (section 01-10 MECHANICAL). |
| | | No | Go to the next step. |
| 2 | Verify if the noise is coming from the drive belt. Using a sound scope, is the noise heard from around the parts driven by a drive belt, such as generator or A/C compressor? | Yes | Go to "Generator Drive Belt and Related Parts Noise" procedure. |
| | | No | Go to the next step. |
| 3 | Verify if the noise is coming from the intake manifold. Is the noise heard from around the intake manifold? | Yes | Go to the next step. |
| | | No | Go to Step 5. |

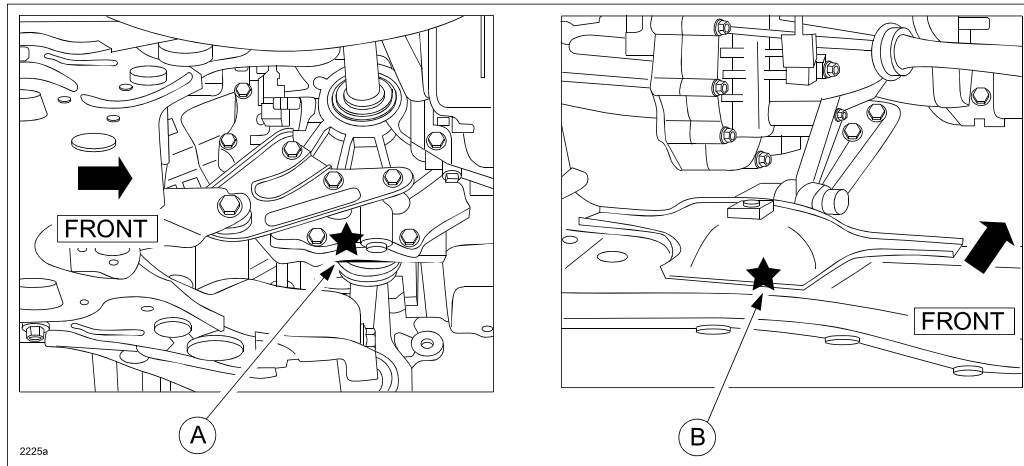
| | | | |
|---|---|-----|---|
| 4 | Verify if the noise is coming from the IMTV or IMRC (inside intake manifold). Does the noise level change when activating and deactivating IMTV-IMRC by M-MDS simulation function? | Yes | Replace the intake manifold according to Workshop Manual (section 01-13 INTAKE MANIFOLD REMOVAL/ INSTALLATION). |
| | | No | Go to the next step. |
| 5 | Verify if the noise is coming from the drive train or exhaust. Is the noise heard from the drive train or exhaust system? | Yes | This procedure is not applicable. Exhaust or drive train system is suspected. Refer to Workshop Manual (section 01-15 EXHAUST SYSTEM, 02 SUSPENSION, 03 DRIVELINE/AXLE, 04 BRAKES or 05 TRANSMISSION/ TRANSAXLE). |
| | | No | Go to the next step. |
| 6 | Verify if the noise is coming from the engine itself. Is the noise heard from the engine itself? | Yes | Go to diagnostic procedure for "Engine Noise". |
| | | No | 2004-2009 Mazda3 2006-2010 Mazda5 Go to the next step. 2010 Mazda3 2006-2010 MX-5 2003-2010 Mazda6 (L3/L5 engine) Go to Step 8. |
| 7 | Verify if the noise is coming from the fuel distributor due to fuel pulsation. Does the noise go away or change by adding approx. 200g (7 oz.) of weight on the fuel distributor? | Yes | Contact Mazda Technical Assistance Hotline and advise them there is an issue with the fuel distributor. |
| | | No | Go to the next step. |
| 8 | Verify if the noise is coming from the purge valve. Does the noise occur when the purge valve is activated by M-MDS simulation function, then goes away when deactivated? | Yes | This procedure is not applicable. Purge system is suspected. Refer to Workshop Manual (section 01-16 PURGE VALVE INSPECTION). |
| | | No | Contact Mazda Technical Assistance Hotline. |

MAZDA3 AND MAZDA5: POINTS TO MEASURE THE NOISE AROUND THE ENGINE MOUNTS:

No. 1 Engine Mount:

Engine Side: Around transmission case bracket tightening point (A).

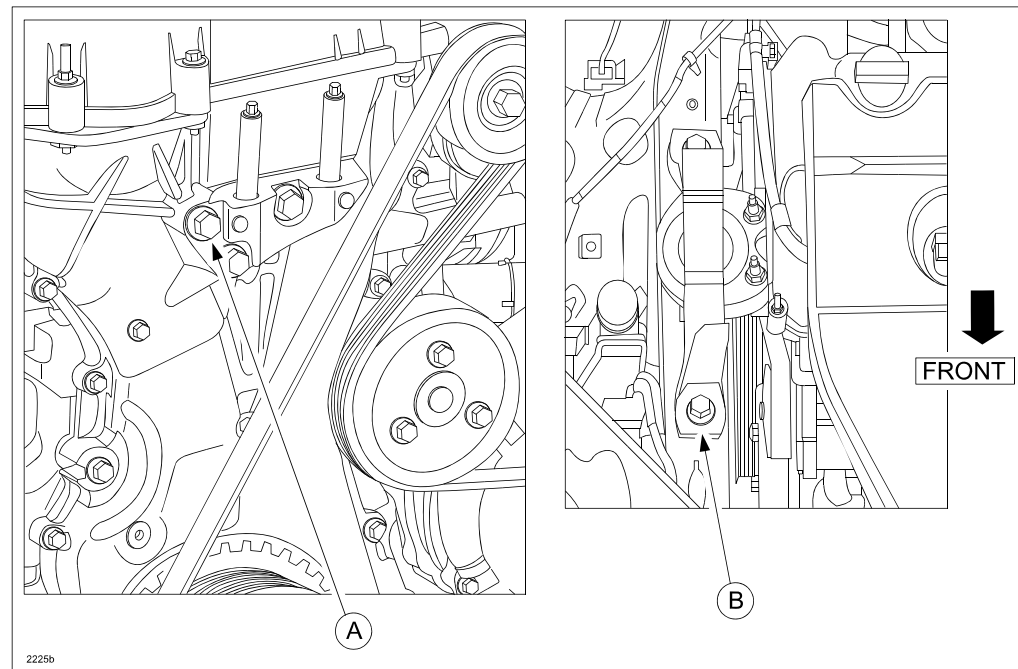
Body Side: Around mounting rubber fixing point on crossmember (B).



No. 3 Engine Mount:

Engine Side: No. 20 front cover bolt head located below No. 3 engine mount fixing point (A).

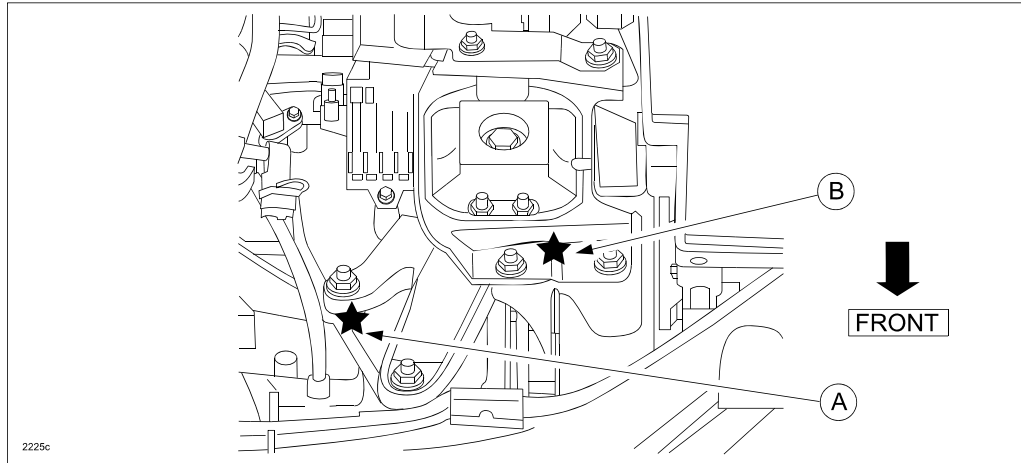
Body Side: No. 3 engine mount tightening bolt (B).



No. 4 Engine Mount:

Engine Side: Around transmission case mount bracket fixing point (A).

Body Side: Around mount bracket fixing point (vehicle side) (B).

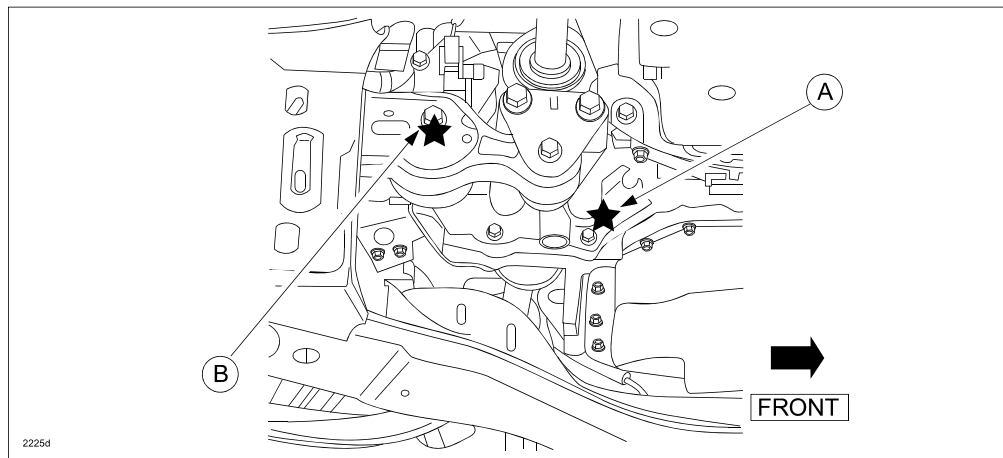


MAZDA6: POINTS TO MEASURE THE NOISE AROUND THE ENGINE MOUNTS:

No. 1 Engine Mount:

Engine Side: Around transmission case bracket tightening point (A).

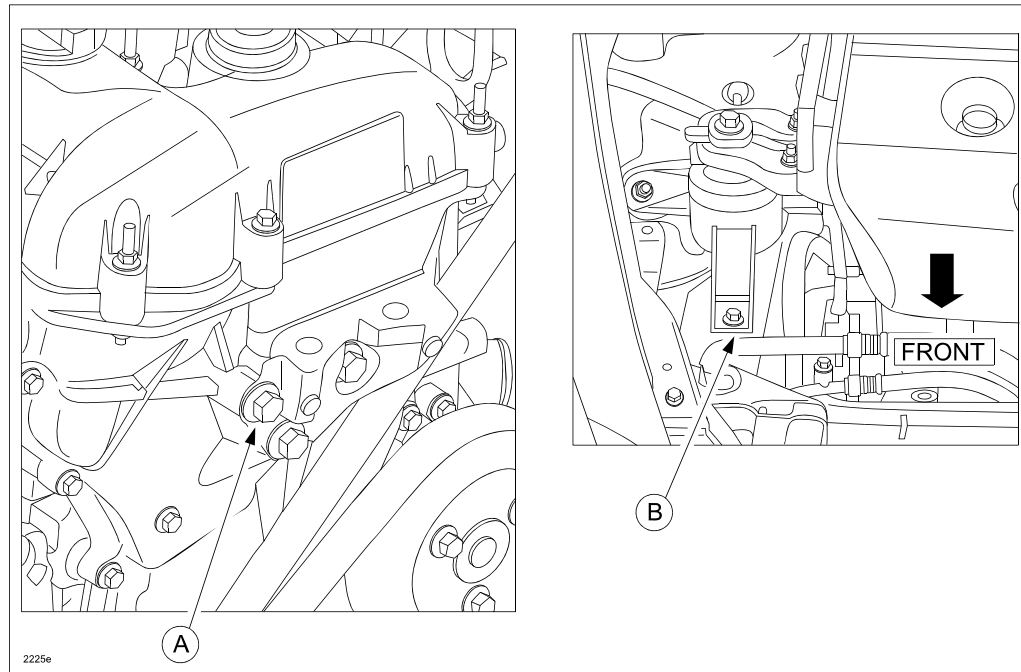
Body Side: Around mounting rubber fixing point on crossmember (B).



No. 3 Engine Mount:

Engine Side: No. 20 front cover bolt head located below No. 3 engine mount fixing point (A).

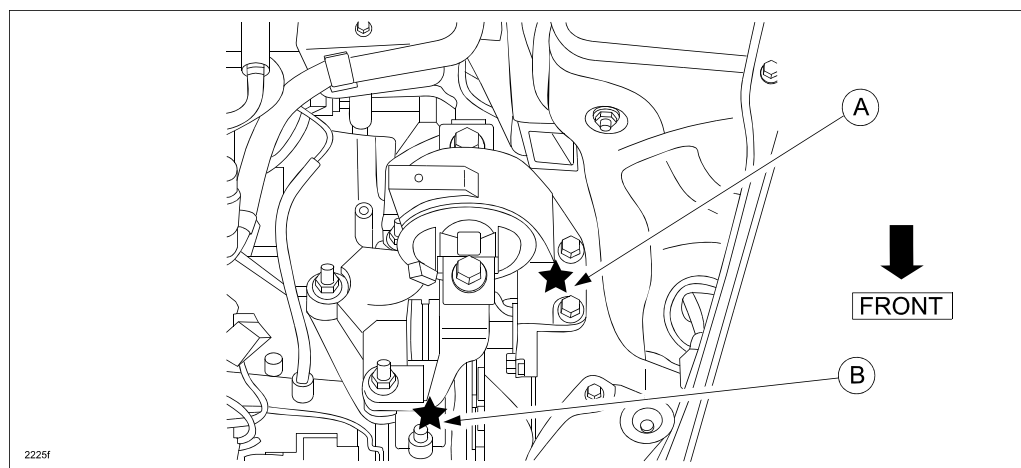
Body Side: No. 3 engine mount tightening bolt (body side) (B).



No. 4 Engine Mount:

Engine Side: Around transmission case mount bracket fixing point (engine side) (A).

Body Side: Around mount bracket fixing point (vehicle side) (B).

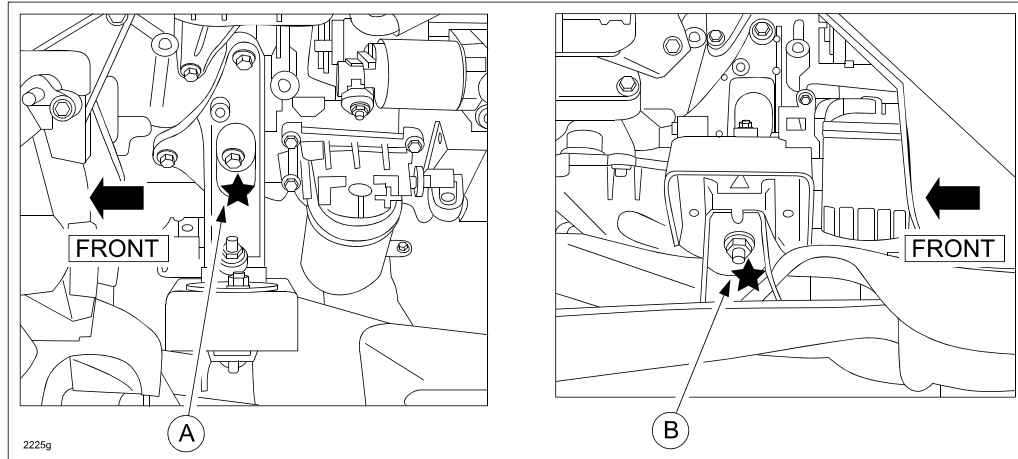


MX-5: POINTS TO MEASURE THE NOISE AROUND THE ENGINE MOUNTS:

Intake manifold side engine mount:

Engine Side: Engine mount bracket (A).

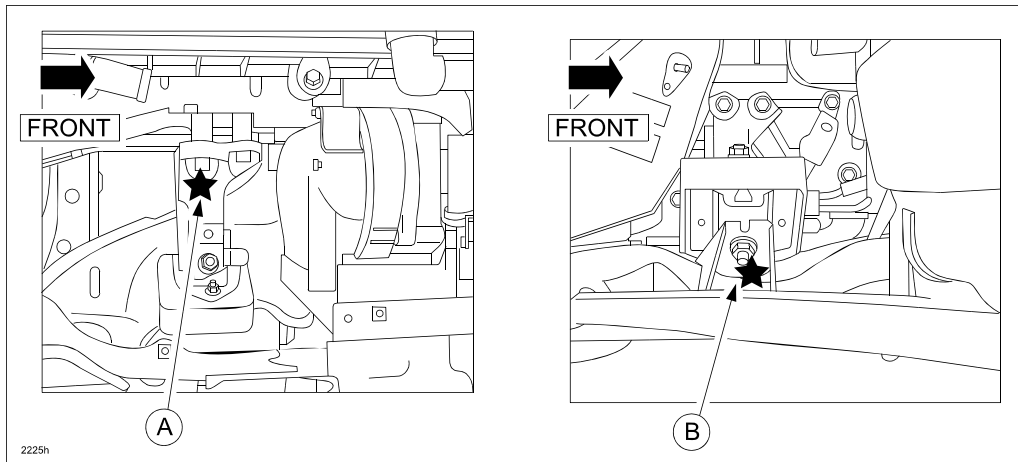
Body Side: Around mounting rubber fixing point on crossmember (B).



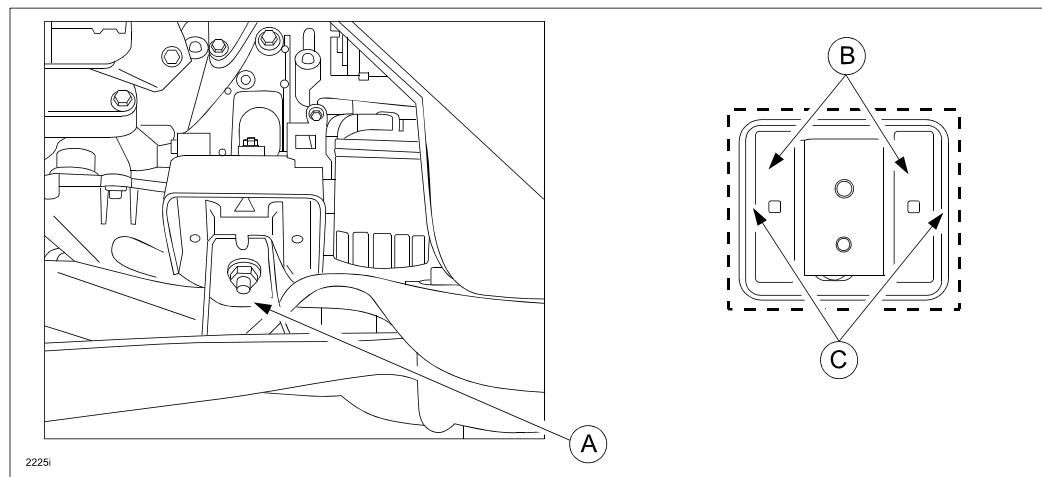
Exhaust manifold side engine mount:

Engine Side: Engine mount bracket (A).

Body Side: Around mounting rubber fixing point on crossmember (B).



Check the engine mount (A) installed on both sides of the vehicle and verify that the shape of engine mount rubber (B) is symmetrical and not touching its housing (C).



GENERATOR DRIVE BELT AND RELATED PARTS NOISE

| Step | Inspection | Result | Action |
|------|---|--------|---|
| 1 | Verify if the noise is due to a fatigued drive belt. Does the drive belt auto tensioner indicator mark exceed the limit? Refer to Workshop Manual (section 01-10 DRIVE BELT INSPECTION). | Yes | Replace the drive belt according to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). |
| | | No | Go to the next step. |
| 2 | Verify if the noise is coming from the A/C compressor. Shift into N range or neutral then turn the A/C on/off and compare the noise. Is the noise level greater with the A/C on than it is with the A/C off? NOTE: The purpose of this step is to check if continuous noise occurs when the A/C is on, not to check the on/off noise of the compressor magnet clutch. | Yes | Replace the A/C compressor according to Workshop Manual (section 07-11 A/C COMPRESSOR REMOVAL/INSTALLATION). |
| | | No | 2004-2009 Mazda3 2010 Mazda3 (except L5 engine) 2006-2010 Mazda5 Go to the next step. 2006-2010 MX-5 2003-2010 Mazda6 (L3/L5 engine) 2010 Mazda3 (L5 engine) Go to Step 6. |
| 3 | Verify if the noise is coming from the A/C compressor drive belt and/or pulley. Mazda3 (except 2010 L5 engine) or Mazda5: Does the noise go away when running the engine without the A/C belt? Refer to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). | Yes | Go to the next step. |
| | | No | Go to Step 6. |
| 4 | Verify if the noise is due to foreign material. Mazda3 (except 2010 L5 engine) or Mazda5: Any foreign material stuck between the A/C drive belt and pulley? | Yes | Remove foreign material and clean the A/C belt or pulley. |
| | | No | Go to the next step. |

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| 5 | Verify if the noise is due to a damaged A/C drive belt and/or pulley. Mazda3 (except 2010 L5 engine) or Mazda5: Any damage found on the A/C drive belt or pulley? | Yes | Replace the damaged part(s) according to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). |
| | | No | A/C belt damage is suspected. Replace the A/C belt according to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). |
| 6 | Verify if the noise is coming from the drive belt or components driven by the belt. Does the noise go away when running the engine without the generator drive belt? Refer to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). NOTE: To run the engine without the belts, follow the conditions below. <ul style="list-style-type: none"> - Keep engine at 1,500 rpm or lower during the stall test in D range. - Keep the engine at 2,000 rpm or lower when in N range. - Running period should be less than ten (10) seconds (from engine start to engine stop). - For continuous test, run the engine at intervals of thirty (30) minutes or more, cooling the engine with a large shop fan. | Yes | Go to the next step. |
| | | No | Issue is not belt related, go back to "Diagnostic Procedure". |
| 7 | Verify if the noise is due to foreign material. Any foreign material stuck between the pulley and belt? | Yes | Remove foreign material and clean the belt and pulley. |
| | | No | Go to the next step. |
| 8 | Verify if the noise is due to a damaged belt and/or pulley. Any damage found on the drive belt or pulley? | Yes | Replace the damaged part(s) according to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION). |
| | | No | Go to the next step. |
| 9 | Verify if the noise is due to a generator malfunction. Any unusual resistance felt when turning the generator by hand? | Yes | Replace the generator according to Workshop Manual (section 01-17 GENERATOR REMOVAL/INSTALLATION). |
| | | No | Go to the next step. |

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| 10 | <p>Verify if the noise is due to an auto tensioner malfunction.</p> <p>Any unusual resistance felt or squeak noise heard when moving the drive belt auto tensioner by hand?</p> <p>Refer to Workshop Manual (section 01-10 DRIVE BELT AUTO TENSIONER INSPECTION).</p> | Yes | Replace the drive belt auto tensioner according to Workshop Manual (section 01-10 DRIVE BELT AUTO TENSIONER REMOVAL/INSTALLATION). |
| | | No | Go to the next step. |
| 11 | <p>Verify if the noise is coming from the auto tensioner.</p> <p>Install the generator drive belt and A/C belt according to Workshop Manual (section 01-10 DRIVE BELT AUTO TENSIONER REMOVAL/INSTALLATION).</p> <p>Compare the noise level of "N range with A/C ON" and "D range with A/C ON".</p> <p>Is the noise level greater in "D range with A/C ON" than it is in "N range with A/C ON"?</p> | Yes | If the drive belt auto tensioner has not been replaced yet, replace it according to Workshop Manual (section 01-10 DRIVE BELT AUTO TENSIONER REMOVAL/INSTALLATION). |
| | | No (or M/T equip.) | <p>2004-2010 Mazda3 2006-2010 Mazda5 Go to Step 13.</p> <p>2006-2010 MX-5 2003-2010 Mazda6 (L3/L5 engine) Go to the next step.</p> |
| 12 | <p>Verify if the noise is due to a power steering system malfunction.</p> <p>Shift to N range or neutral, then perform static steering.</p> <p>Does the noise become worse?</p> <p>NOTE: The noise can be easily checked by touching the "eye bolt" which is connected to the high pressure side pipe to power steering pump.</p> | Yes | Refer to power steering diagnostics according to Workshop Manual (section 06-14 POWER STEERING). |
| | | No | Go to the next step. |
| 13 | <p>Verify if the noise is coming from the water pump.</p> <p>Is the noise heard just from around the water pump area?</p> | Yes | Replace the water pump according to Workshop Manual (section 01-12 WATER PUMP REMOVAL/INSTALLATION). |
| | | No | Go to the next step. |
| 14 | <p>Verify if the noise is due to a damaged drive belt.</p> <p>If the drive belt has not been replaced yet, replace it according to Workshop Manual (section 01-10 DRIVE BELT REMOVAL/INSTALLATION).</p> <p>Is the noise gone?</p> | Yes | Completed. |
| | | No | Contact Mazda Technical Assistance Hotline. |

ENGINE NOISE

| Step | Inspection | Result | Action |
|------|---|---|--|
| 1 | Verify if the noise only occurs when starting the engine. Does the noise only occur when starting the engine after the vehicle sits overnight? | Yes | Go to the next step. |
| | | No | Go to Step 3. |
| 2 | Verify if the noise is due to a VVT lock function malfunction. When rotating the intake camshaft, does the intake cam sprocket slip? Any cracks or damage visually found around the VVT lock pin stopper? For illustration purposes, refer to the following TSBs: 01-026/09 - "VARIABLE VALVE TIMING (VVT) NOISE WHEN STARTING ENGINE" AND 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE." | If Yes to either question | Replace the VVT according to Workshop Manual (section 01-10 VARIABLE VALVE TIMING ACTUATOR REMOVAL/ INSTALLATION). |
| | | No | Contact Mazda Technical Assistance Hotline. |
| 3 | Roughly verify the noise location. Where is the noise heard the most? | Around the valve cover or cylinder head | Valve noise, cam journal damage or the noise is due to piston hitting cylinder head are suspected. Go to Steps 4~7. |
| | | Around the engine block | Piston slap or the noise is due to piston hitting cylinder head are suspected. Go to Steps 8~11. |
| | | Around the oil pan | Connecting rod material damage and/or balancer unit trouble is suspected. Go to Step 12~16. |
| 4 | Verify if the noise is due to an out-of-spec valve clearance. Inspect the valve clearance. Is it within specification? Standard of inspection (engine cold): IN: 0.22-0.30mm EX: 0.27-0.37mm Refer to Workshop Manual (section 01-10 VALVE CLEARANCE INSPECTION). | Yes | Go to Step 6. |
| | | No | Go to the next step. |

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| 5 | <p>Verify if the out-of-spec valve clearance is due to damage of camshaft journal.</p> <p>Remove the camshaft.</p> <p>Any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Contact MASH for head replacement authorization. |
| | | No | <p>Valve noise is suspected.</p> <p>Adjust valve clearance according to Workshop Manual (section 01-10 VALVE CLEARANCE ADJUSTMENT).</p> <p>Standard of adjustment (engine cold): IN: 0.22-0.28mm EX: 0.27-0.33mm</p> |
| 6 | <p>Verify if the noise is due to piston hitting cylinder head caused by seized and/or damaged connecting rod bearing.</p> <p>Remove the oil pan and check the connecting rod bearings.</p> <p>Any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Go to the next step. |
| | | No | Contact Mazda Technical Assistance Hotline. |
| 7 | <p>Verify if the cylinder head can be reused.</p> <p>Is there any sign of contact between the piston and cylinder head found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | A partial engine may be needed. Contact MASH for authorization. |
| | | No | Contact MASH for short block authorization. |
| 8 | <p>Verify if the noise depends on combustion pressure.</p> <p>Does the noise decrease when halting cylinder ignition?</p> <p>Refer to Service Highlights (section 01-02 SIMULATION TEST) and perform the procedure below.</p> <p>1. Connect M-MDS, then select "Data Logger".</p> <p>2. Using simulation function, intentionally cause misfire one by one.</p> <p>(On and Off INJ_1, INJ_2, INJ_3, INJ_4)</p> | Yes | Go to the next step. |
| | | No | Go to Steps 10~11. |

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| 9 | <p>Verify if the noise is due to piston hitting cylinder head caused by seized and/or damaged connecting rod bearing.</p> <p>Remove the oil pan and check the connecting rod bearings.</p> <p>Is there any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Go to Step 11. |
| | | No | Replace the piston according to Engine Workshop Manual (section 01-10 MECHANICAL). |
| 10 | <p>Verify if the noise is due to piston hitting cylinder head caused by seized and/or damaged connecting rod bearing.</p> <p>Remove the oil pan and check the connecting rod bearings.</p> <p>Is there any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Go to the next step. |
| | | No | Contact Mazda Technical Assistance Hotline. |
| 11 | <p>Verify if the cylinder head can be reused.</p> <p>Is there any sign of contact between the piston and cylinder head found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | A partial engine may be needed. Contact MASH for authorization. |
| | | No | Contact MASH for short block authorization. |
| 12 | <p>Verify if the noise depends on combustion pressure.</p> <p>Does the noise decrease when halting cylinder ignition?</p> <p>Refer to Service Highlights (section 01-02 SIMULATION TEST) and perform the procedure below.</p> <p>1. Connect M-MDS, then select "Data Logger".</p> <p>2. Using simulation function, intentionally cause misfire one by one.</p> <p>(On and Off INJ_1, INJ_2, INJ_3, INJ_4)</p> | Yes | Go to the next step. |
| | | No | Go to Step 14. |
| 13 | <p>Verify if the noise is due to piston hitting cylinder head caused by seized and/or damaged connecting rod bearing.</p> <p>Remove the oil pan and check the connecting rod bearings.</p> <p>Is there any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Go to Step 15. |
| | | No | Contact Mazda Technical Assistance Hotline. |

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| 14 | <p>Verify if the noise is due to piston hitting cylinder head caused by seized and/or damaged connecting rod bearing.</p> <p>Remove the oil pan and check the connecting rod bearings.</p> <p>Is there any damage and/or sign of burnt or seizure found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | Go to next step. |
| | | No | Go to Step 16. |
| 15 | <p>Verify if the cylinder head can be reused.</p> <p>Is there any sign of contact between the piston and cylinder head found?</p> <p>Refer to the following TSB: 01-042/09 - "SERVICE POINTS FOR ENGINE REPLACEMENT DUE TO ENGINE NOISE."</p> | Yes | A partial engine may be needed. Contact MASH for authorization. |
| | | No | Contact MASH for short block authorization. |
| 16 | <p>Verify if the noise is due to improper gear backlash of balancer unit.</p> <p>Any problem found with gear backlash of balancer unit?</p> <p>Refer to Engine Workshop Manual (section 01-10 CYLINDER BLOCK ASSEMBLY / Balancer Unit Assembly Note).</p> | Yes | Adjust the balancer unit and crankshaft gear backlash according to Engine Workshop Manual (section 01-10 CYLINDER BLOCK ASSEMBLY / Balancer Unit Assembly Note). |
| | | No | Contact Mazda Technical Assistance Hotline. |